KNOWLEDGE EXPECTATIONS FOR PEST CONTROL ADVISERS: DEFOLIATION AND OTHER HARVEST AID PRACTICES

I. INTRODUCTION

Define:

- defoliation;
- desiccation.

A. The Purpose of Harvest Aids in California Cotton

List the reasons for using harvest aids.

List the advantages of manipulating harvest timing.

Describe how harvest aids sustain quality.

II. PHYSIOLOGICAL PROCESSES INVOLVED IN DEFOLIATION AND DESICCATION

Recognize that defoliation is a natural process.

Describe how the following plant hormones affect senescence and/or abscission:

- auxin;
- cytokinin;
- gibberellin;
- ethylene;
- abscissic acid.

Identify, on a cotton plant, the:

- abscission zone;
- petiole;
- leaf blade;
- stem;
- vascular tissue.

Recognize where leaf abscission takes place on cotton.

Describe the differences between the leaf cuticle of an old leaf and a young leaf and how this affects the use of harvest aids.

Describe how plant water stress affects harvest aid penetration through the leaf cuticle.

Distinguish the difference in plant response to application of defoliants and desiccants.

List conditions that affect the rate and degree of natural defoliation (insects; leaf age; disease; water stress; fruit load; nitrogen level).

III. COTTON

Describe the crop cycle of cotton in California.

Describe the stages of cotton growth and how long each takes.

Describe the approximate amount of time after flowering it takes a boll to:
- reach final fiber length;
- develop a high viability seed;
- reach fiber maturity.

Describe how conditions during flowering and boll development can affect boll quality and maturation.

Describe how defoliant efficacy is impacted by the perennial nature of the cotton plant.

List some differences between growth habits and lint quality of California Upland and Pima varieties of cotton.

Define:
- boll;
- square;
- module;
- rank growth;
- cutout;
- cracked boll;
- first position boll;
- nodes above crack boll (NACB).

IV. HARVEST AIDS AND THEIR USES

A. Preparing for Harvest Aid Applications

Describe how to determine appropriate application timing for:

defoliants;
desiccants;
boll openers;
other materials used as harvest aids.

Describe how the following factors can alter the choice and effectiveness of harvest aids:
application rate;
nitrogen status;
water status;
plant maturity;
air temperature;
weed infestations;
arthropod pests—aphid, whitefly, and spider mites;
plant population density;
humidity / precipitation;
plant vigor/canopy density.

Describe how the presence of johnsongrass, pigweed, nightshade, and annual and perennial morningglory can affect defoliation decisions.

Identify how target harvest dates are determined.

Describe how to determine boll maturity and maximum harvestable bolls using the following methods:
sharp knife technique;
percent open bolls;
nodes above cracked boll (NACB);
seed coat color change;
plant monitoring.

Describe how to measure nodes above cracked boll (NACB).

Describe the relationship between harvest aid application timing based on Nodes Above Cracked Boll (NACB) and yield and quality.

B. Environmental and Plant Factors Affecting Defoliation

Describe the general effects of the following factors on the ease of cotton defoliation:
temperature;
humidity;
plant water stress;

soil water availability;
soil and plant nitrogen;
insects;
weeds;
plant size and vigor;
difficulty in chemical penetration of plant cover;
boll load.

Recognize the differences in response to defoliation material choices and timing in the Pima versus Upland varieties of cotton.

Describe how vegetative growth is affected by:
early or mid-season boll retention;
lygus damage;
nitrogen levels;
soil water levels;
temperature.

Describe how the relative level of plant vigor affects defoliation.

Explain why regrowth can occur and how to manage it.

List plant and cultural management factors important in assessing regrowth potential.

Identify how regrowth potential affects harvest aid selection.

Describe how incomplete leaf drop increases gin trash, which reduces the quality and successful module storage of lint.

C. Types of Harvest Aids

Recognize that harvest aids can
-have herbicidal activity
-have hormonal activity
-act as boll openers
-act as defoliants and/or desiccants.

Understand that the results of harvest aid use can depend upon many factors including plant status, environmental conditions and application rates.

1. Defoliants

Recognize that the following materials are defoliants and can be used at certain rates and environmental conditions:

- dimethipin;
- sodium chlorate;
- thidiazuron;
- tribufos;
- thidiazuron plus diuron.

List the conditions that favor the use of defoliants and how an appropriate defoliant and application rate is determined.

Recognize that defoliants induce plant stress to cause defoliation but do not kill plants.

2. Desiccants

Recognize that the following materials can be used as desiccants at certain rates and environmental conditions:

- paraquat;
- sodium chlorate.

Describe how desiccants affect plant cells.

Describe how the following factors affect the efficacy of desiccants:

- soil residual moisture;
- plant-water status;
- rate of desiccant application;
- air temperature;
- humidity;
- prior use of harvest aids;
- plant canopy density.

3. Boll Openers

Recognize that the following materials are boll openers:

- ethephon;
- ethephon plus AMADS;
- ethephon plus cyclanilide.

Describe the use of boll openers as harvest aids.

Recognize the proper application timing for boll openers.

Describe conditions in which the application of a boll opener would reduce quality and yield.

4. Other Harvest Aid Materials

Recognize the following materials and understand how they are used on cotton in California:

endothall;
glyphosate;
mepiquat chloride.

Recognize the benefits of using glyphosate as a harvest aid (improve boll opening, enhanced defoliation; weed control; regrowth control).

5. Harvest Aids for Organic Cotton

Recognize that the following materials can be used as harvest aids for organically grown cotton:

magnesium chloride;
zinc sulphate;
zinc sulphate plus Chilean nitrate;
zinc plus citric acid.

Describe a problem associated with the use of magnesium chloride in organically grown cotton.

Explain why organically grown cotton typically cannot be stored in modules even when machined harvested.

6. Adjuvants

Describe the function of adjuvants when using harvest aids.

Recognize that defoliant labels list required or recommended adjuvants.

D. Application Methods and Considerations for Harvest Aid Use

Describe some environmental, safety, and coverage problems associated with harvest aid application by aircraft.

Describe situations in which applications of harvest aids using ground equipment would be advantageous.

Describe the importance of leaf coverage on desiccant or defoliant effectiveness.

Explain how droplet size is adjusted and how it impacts harvest aid effectiveness.

Describe the regulations that apply to the use of harvest aids.

Recognize the most appropriate combination of harvest aids for the following situations:

Condition 1: fields with uniform or heavy boll load, abrupt cutout, and warm temperatures (>80° F.) at and following application.

Condition 2: late plantings, low boll retention, rank growth and/or cool temperatures (<80° F.) at application.